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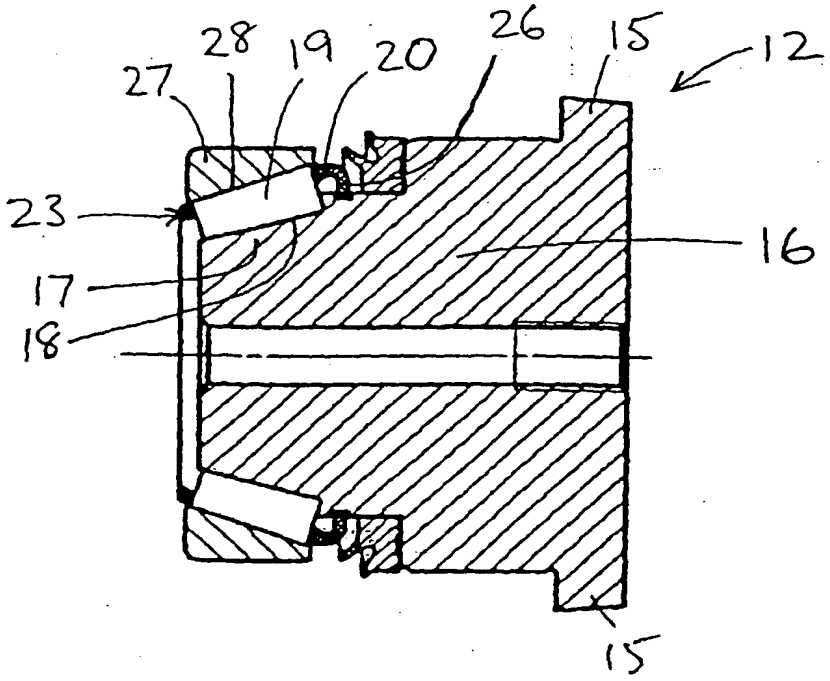
(54) Title: IMPROVEMENTS IN OR RELATING TO STEERING PIVOTS



(57) Abstract: There is provided a steering pivot arrangement (12) having a pivot pin (16). The pivot pin (16) provides an inner race section (17) providing an inner raceway (18). A roller cage (20) retains a number of tapered rollers (19) on the inner raceway. The cage (20) has a number of resilient inward projections (26) spaced around its periphery. The projections (26) are clipped into an annular groove (22) behind a roller abutment rib at the large end of the raceway (18).

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Improvements in or Relating to Steering Pivots

The present invention relates to steering pivots primarily but not exclusively for the driving and steering axle of, for example, agricultural or industrial vehicles.

According to the present invention there is provided a steering pivot comprising a pivot pin providing an integrally formed radially inner race defining a circumferentially extending inner raceway, and a cage retaining therein at spaced locations rolling elements which contact the inner raceway, the cage being retained relative to the pivot pin by means of a clip connection..

Preferably there is also provided an outer race which defines a circumferentially extending outer raceway which engages the rolling elements. Conveniently, the rolling elements are tapered rollers and the inner and outer raceways are part-conical.

It is a preferred feature that the clip connection is constituted by resilient radially inward projections provided at spaced locations around the large end of the cage. The projections can be received in a circumferential groove in the large outside diameter of the inner race. Normally the large axial end of the inner raceway has a circumferential rib against which the rolling elements engage and the circumferential groove is provided immediately axially behind the rib. Preferably a seal element is provided behind the circumferential groove.

In preferred arrangements the pivot pin has a flange at its end remote from the narrow end of the inner race, the flange having a number of holes for facilitating attachment to a support arm.

Embodiments of the present invention will now be described in more detail, the description making reference to the following drawings in which:

Figure 1 is a vertical cross-section through one end of a driving and steering axle, ideally for agricultural or industrial vehicles,

Figure 2 is a cross-section in isolation of an integrated steering pivot illustrated in figure 1,

Figure 3 is a cross-section of a pivot pin incorporated in the steering pivot of figure 2,

Figure 4 is a perspective view of a roller cage utilised in the present invention, and

Figure 5 is a cross-section similar to figure 2 of an alternative embodiment.

In figures 1 to 4 there is shown a generally known integrated steering pivot package 10 for the driving and steering axle 11 of a vehicle which may, for example, be agricultural or industrial. In such an arrangement there are a pair of integrated steering pivots 12 at each end of the axle 11, each pivot 12 being secured with respect to a support arm 13 by means of bolts 14 which extend through respective holes in a flange portion 15 at one end of a pivot pin 16.

Each pivot pin 16, made for example from steel, has at its other end an integrally formed inner race section 17 which provides a part-conical inner raceway 18 for a set of tapered rollers 19. The rollers are retained in a roller cage 20, made for example from a suitable polymer compound. At the large end of the inner raceway, nearer the flange portion 15, is a peripheral rib 21 which acts as an abutment for the rollers 19. Further towards the flange 15 and immediately beyond the peripheral rib 21 is an annular groove 22.

The cage 20 is largely conventional in appearance having a narrow end 33, a large end 24 and a series of openings 25 spaced around its periphery for receiving the rollers 19. At the large end 24 there are a number of resilient inward projections 26 at spaced locations around the periphery. The cage 20 is clipped on to the pivot pin 16 by means of the

projections 26 moving resiliently past the rib 21 and engaging in the annular groove 22 behind the rib 21. This retention of the cage 20 and associated rollers 19 relative to the inner race section 17 means that it is not necessary to provide a further rib, as is conventional, at the small end of the inner raceway, that is at the end of the inner raceway most remote from the flange 15.

Each pivot 12 also provides an outer race 27 which provides a part-conical outer raceway 28 for engagement with the rollers 19 in a conventional manner, the outer race 27 being connected to a further component of the vehicle which has not been shown.

It will be appreciated that this arrangement produces an integrated steering pivot which reduces the number of component parts and thus reduces the assembly time and cost.

In figure 5 there is shown a steering pivot pin 112 having a pivot 116 similar to that shown in figures 1 to 3 (like parts having a prefix '1'). In this embodiment there is an axial extension 150 remote from the flange 115. The extension 150 has an axial groove 151 for receiving a sensor (not shown) for example an angular position sensor.

It will be appreciated that the number and precise form of the projections 26 is a matter of design choice but in the illustrated embodiment there are ten equispaced projections for a twenty roller cage, i.e. two rollers per projection. In addition the projections 26 have been located at the junctions of every other axial divider 29 and the large peripheral ring 30 defining the cage 20, but alternatives could be envisaged. Suitable modifications would be possible to accommodate cages of different size and construction. Also, other bearing types could be incorporated instead of the tapered roller bearing described above.

Claims

1. A steering pivot comprising a pivot pin providing an integrally formed radially inner race defining a circumferentially extending inner raceway, and a cage retaining therein at spaced locations rolling elements which contact the inner raceway, the cage being retained relative to the pivot pin by means of a clip connection.

2. A steering pivot as claimed in claim 1 wherein there is also provided an outer race which defines a circumferentially extending outer raceway which engages the rolling elements.

3. A steering pivot as claimed in claim 1 or claim 2 wherein the rolling elements are tapered rollers and the inner and outer raceways are part-conical.

4. A steering pivot as claimed in any one of claims 1 to 3 wherein the clip connection is constituted by resilient radially inward projections provided at spaced locations around the large end of the cage.

5. A steering pivot as claimed in claim 4 wherein the projections are received in a circumferential groove in the large outside diameter of the inner race.

6. A steering pivot as claimed in claim 5 wherein the large axial end of the inner raceway has a circumferential rib against which the rolling elements engage and the circumferential groove is provided immediately axially behind the rib.

7. A steering pivot as claimed in claim 6 wherein a seal element is provided behind the circumferential groove.

8. A steering pivot as claimed in any one of claims 1 to 7 wherein the pivot pin has a flange at its end remote from the narrow end of the inner race, the flange having a number of holes for facilitating attachment to a support arm.
9. A steering pivot as claimed in any one of claims 1 to 8 wherein the pivot pin has an axial extension beyond the narrow end of the inner race, the axial extension being adapted to receive a sensor.
10. A steering pivot as claimed in claim 9 wherein said axial extension has an axial groove for receiving a sensor.

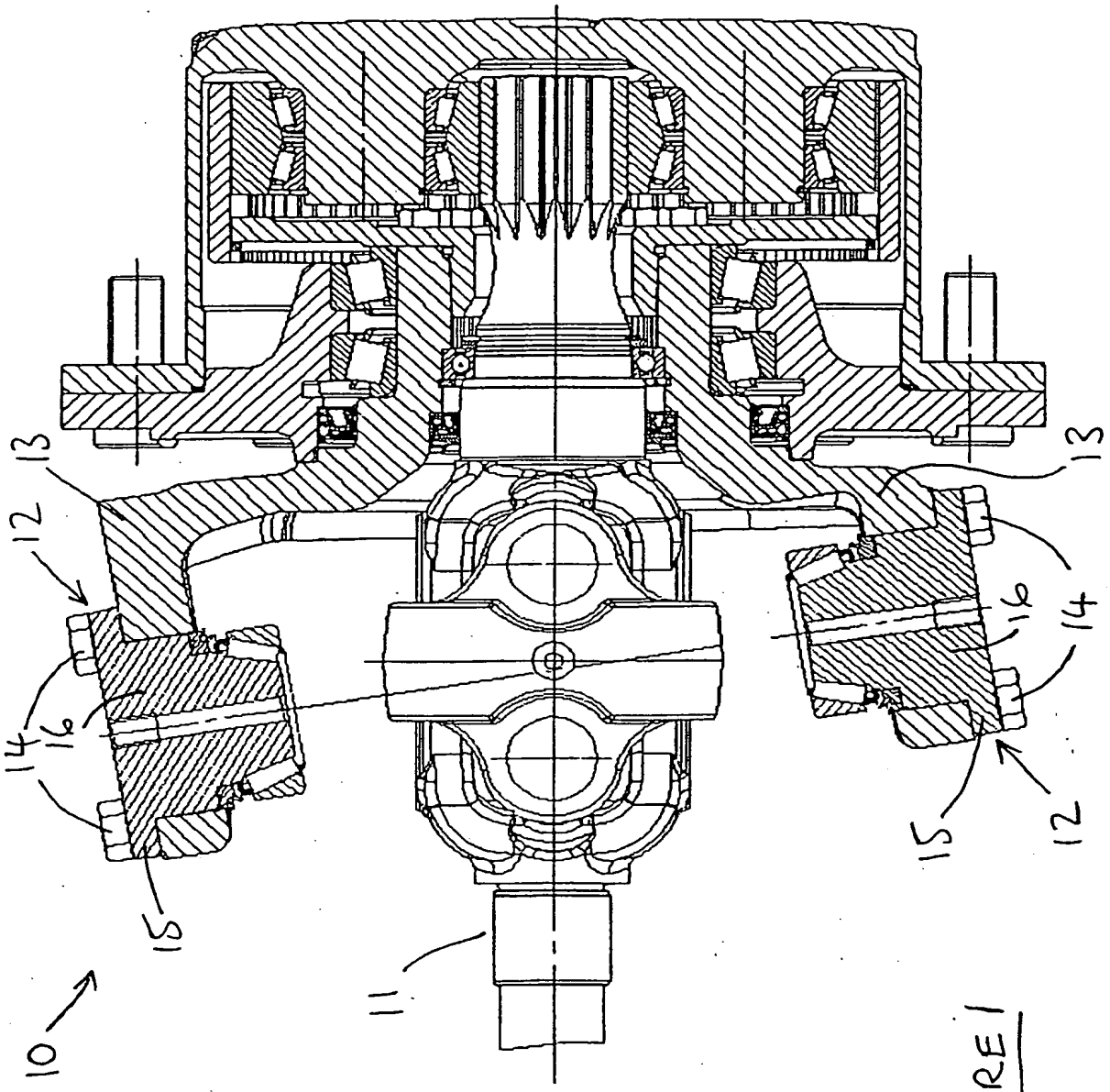

FIGURE 1

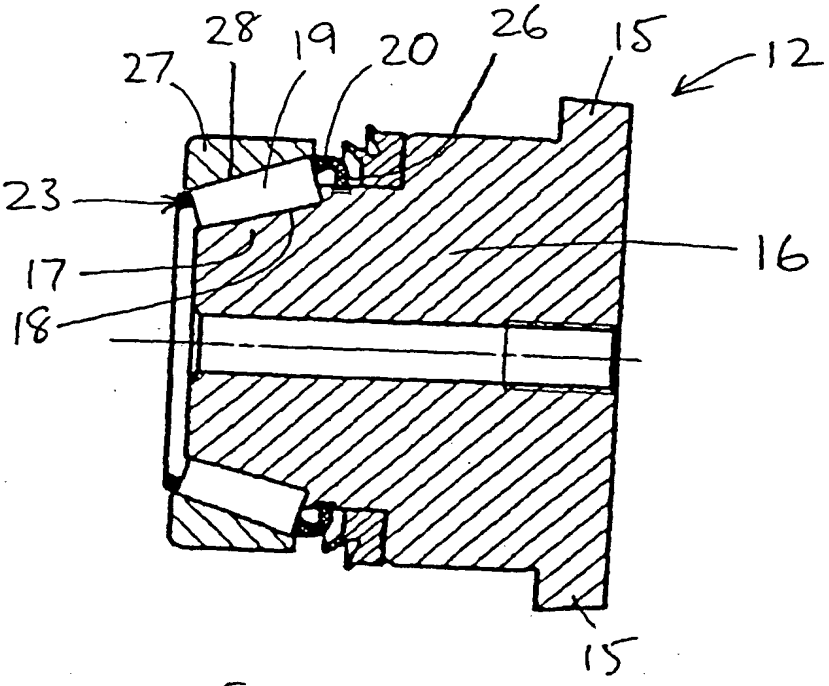

FIGURE 2

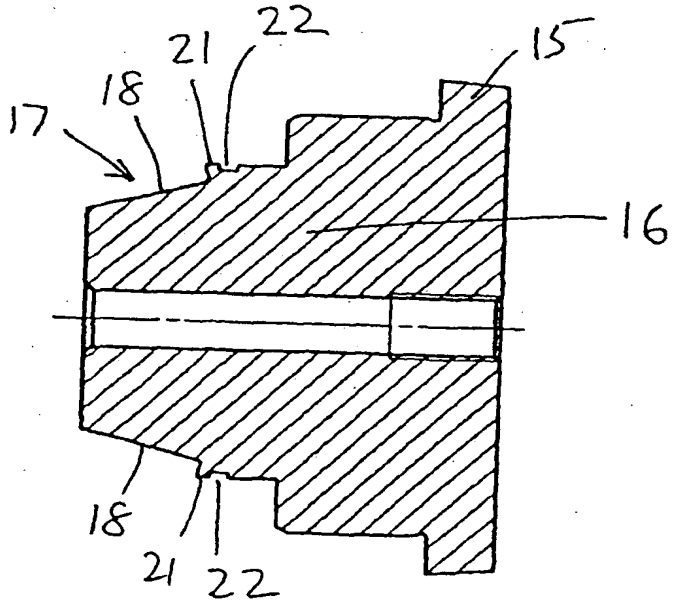

FIGURE 3

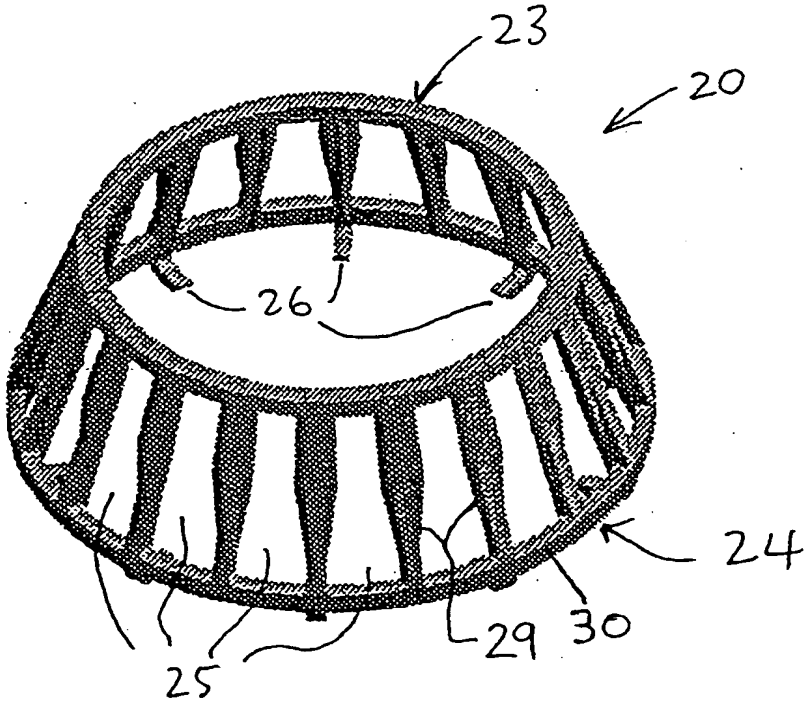

FIGURE 4

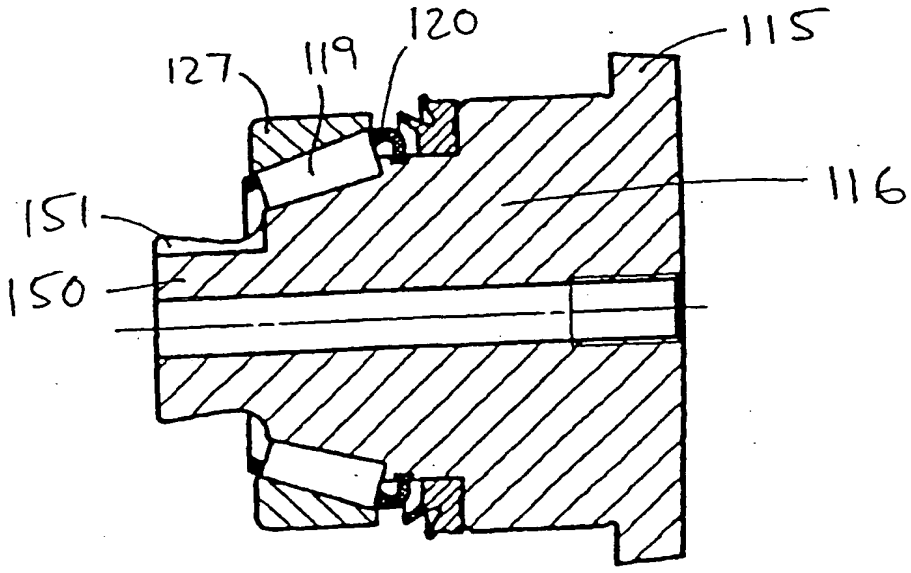

FIGURE 5

INTERNATIONAL SEARCH REPORT

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PCT/EP [illegible]3/02072

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B62D7/18 F16C33/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B62D F16C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 41 41 793 A (ZAHNRADFABRIK FRIEDRICHSHAFEN) 24 June 1993 (1993-06-24) column 4, line 9 - line 15; figure 7 column 4, line 66 - column 5, line 20; figure 10	1-8
Y	JP 2002 054638 A (NTN CORP) 20 February 2002 (2002-02-20) figures 1-3 -& PATENT ABSTRACTS OF JAPAN vol. 2002, no. 06, 4 June 2002 (2002-06-04) -& JP 2002 054638 A (NTN CORP), 20 February 2002 (2002-02-20) abstract	1-8
A	EP 0 330 632 A (SAME SPA) 30 August 1989 (1989-08-30) column 2, line 50 - line 59; figure 2	1,9

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
24 June 2003	01/07/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Kulozik, E.

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In[redacted]ational Application No
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